

***Fracture resistance of milled zirconium  
oxide crown copings with two different  
occlusal taper***

Thesis

Submitted to Fixed Prosthodontics Department

Faculty of Oral and Dental Medicine

CairoUniversity

for Partial Fulfillment of therequirements of Master

Degree in Fixed Prosthodontics

**By**

**Samer Ahmed Mohamed**

**B.D.S**

**CairoUniversity**

Faculty of oral and Dental Medicine

CairoUniversity

(2011)

# *Supervisors*

## **Supervisors**

***Dr. Iman Salah El-Din Hamdy***

*Associate Professor of fixed  
Prosthodontics*

*Faculty of Oral and Dental Medicine  
Cairo University*

***Dr. JylanFouad El-Guindy***

*Associate Professor of fixed  
Prosthodontics*

*Faculty of Oral and Dental Medicine  
Cairo University*

# *Acknowledgment*

*All Praises And Ultimate Thanks To*  
**ALLAH**

## **ACKNOWLEDGMENT**

*I wish to present my heartfelt gratitude to **Dr. Iman Salah El-Din**Hamdy Associate Professor of fixed Prosthodontics Faculty of oral and dental medicine Cairo University, for her generous supportive attitude, extreme unlimited cooperation and understanding. Absolutely I will be always proud to have worked under her direct kind guidance.*

*I am greatly indebted to **Dr. JylanFouad El-Guindy** Associate Professor of fixed Prosthodontics Faculty of oral and dental medicine Cairo University, for her kind support and her constant search for perfection which were a great help to my work. Any words of thanks come short in expressing my deep gratitude to this great personality.*

*Finally I dedicate this work to my family who have done and still doing a lot to me without waiting for anything in return and I hope I can pay even a small part of my debt to them.*

# *List of contents*

## **List o contents**

Contents	Pages
List of tables	I
List of figures	III
Introduction	1
Review of the literature	3
Aim of the study	25
Materials and methods	26
Results	70
Discussion	78
Summery and conclusions	84
References	87
Arabic summery	

## *List Of tables*



## **List of tabels**

Table		page
1	Standard composition of the Ceramill blocks.	27
2	The mechanical, physical and chemical properties of sintered Ceramill YZ blocks.	28
3	Standard composition of the Vita In-Ceram 2000 YZ Cubes for inLab.	30
4	The Mechanical and physical properties of the sintered Vita In-Ceram 2000 YZ dental ceramics.	30
5	Samples grouping of YPS zirconia copings.	32
6	Sample grouping of the stone dies.	41
7	Statistical analysis of the effect of degree of taper on the fracture resistance values of milled zirconium oxide copings regardless the milling technique.	70
8	Statistical analysis of the effect of milling technique on the fracture resistance values of milled zirconium oxide copings regardless the degree of taper.	71
9	Statistical analysis of the effect of degree of taper on the fracture resistance values of manually milled zirconium oxide copings.	72
10	Statistical analysis of the effect of degree of taper on the fracture resistance values of CAD/CAM milled zirconium oxide copings.	73
11	Statistical analysis of the effect of milling technique on the fracture resistance values of milled zirconium oxide copings regardless the degree of taper.	74

12	Statistical analysis of the effect of milling technique on the fracture resistance values of milled zirconium oxide copings regardless the degree of taper.	75
13	Fracture Resistance (N) of different test groups in Newton.	76

## *List of figures*

## **List of figures**

figure	page
1 Ceramill YZ preforms.	27
2 Vita Inceram YZ-65/25.	29
3 Metal die of 6° taper.	33
4 Schematic drawing of the metal die of 6° taper.	33
5 Metal die of 10° taper.	34
6 Schematic drawing of the metal die of 10° taper.	34
7 Perforated copper special tray.	35
8 Schematic drawing of perforated copper special tray.	35
9 Teflon cylindrical base.	36
10 Schematic drawing of the Teflon cylindrical base.	36
11 Pentamix 3 mixing unit with impression syringe.	38
12 Injecting the material around the die.	39
13 Perforated copper special tray seated on the Teflon base during impression making.	39
14 Checking of the impression accuracy.	40
15 The ceramill machine.	42
16 Die spacer application.	43
17 Separating medium application.	44
18 Split copper counter dies.	45
19 Building up composite resin coping into the assembled counter die.	45
20 Cured resin coping on the die.	46
21 Finishing Ceramill gel.	46
22 Checking thickness of resin coping with digital Caliper.	47
23 Rearrange the dies on their stone racks.	47
24 Ceramill YZ Prefoms and their corresponding plastic frame.	49

25	Connecting resin coping to the plastic frame.	49
26	Attaching the Ceramill YZ Preforms to the metal holding plate.	50
27	Attaching the plastic frame to the holding plate.	50
28	Milling starts.	51
29	Milling the outer surface.	51
30	Un-sintered coping in sintering bowl at sintering furnace.	53
31	Coping after sintering at their corresponding dies.	53
32	CEREC inLab milling machine.	55
33	InEos scanner, scanning the die.	56
34	Digital die.	56
35	Finish line on digital die.	57
36	Non anatomical form coping designed on the computer software.	57
37	Vita YZ-65/25 plugged in the CEREC machine.	58
38	Vita YZ- 65/25 after milling and unplugged from the machine.	59
39	Separated milled copings.	59
40	Coping before entering the cleaning firing cycle in the Vaccumat 40 T furnace.	61
41	Copings in the sintering tray.	61
42	Starting sintering cycle.	62
42	Copings seated on their corresponding dies.	62
44	Coping seated on corresponding metal die.	44
45	Impression making for coping and metal die.	64
46	Checking the impression with the coping inside.	64
47	Pouring epoxy resin inside the impression.	65
48	Coping with epoxy resin die after removal from the impression.	66

49	Rearrange copings on their racks.	66
50	Universal testing machine.	67
51	Compressive load applied on occlusal surface of the coping.	68
52	Coping fracture on the universal testing machine.	68
53	Bar chart representing the effect of degree of taper on the fracture resistance values of milled zirconium oxide copings regardless the milling technique.	70
54	Bar chart representing the effect of milling technique on the fracture resistance values of milled zirconium oxide copings regardless the degree of taper.	71
55	Bar chart representing the effect of degree of taper on the fracture resistance values of manual milled zirconium oxide copings.	72
56	Bar chart representing the effect of degree of taper on the fracture resistance values of CAD/CAM milled zirconium oxide copings.	73
57	Bar chart representing the effect of milling technique on the fracture resistance values of milled zirconium oxide copings with 6 degree taper.	74
58	Bar chart representing the effect of milling technique on the fracture resistance values of milled zirconium oxide copings with 10 degree taper.	75
59	Bar chart showing mean fracture resistance values in (N) for different groups.	77

# ***Introduction***